

REMARKS

The present application was filed on March 12, 2001 with claims 1 through 28. Claims 1 through 28 are presently pending in the above-identified patent application. Claims 1, 7, 8, 11, 19, 25, and 26 are proposed to be amended and claims 9, 17, and 27 are proposed to be cancelled herein.

In the Office Action, claims 7, 8, 25, and 26 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner rejected claims 1 (and, apparently, claims 4, 11, and 14) under 35 U.S.C. §103(a) as being unpatentable over Kapoor (United States Patent Number 6,396,886), rejected claims 2 and 12 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Shinde (United States Patent Number 6,192,386), rejected claims 3 and 13 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Goldberg et al. ("Design of Finite Impulse Response Digital Filters with Nonlinear Phase Response," Goldberg, Eli et al.), rejected claims 5, 6, 15, and 16 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Hamming et al. (United States Patent Number 4,074,212), rejected claim 7 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Shinde, and further in view of Hamming et al., rejected claim 8 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Goldberg et al., and further in view of Hamming et al., rejected claims 9, 10, 17, and 18 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad et al. ("Design of Digital Linear-Phase FIR Crossover Systems of Loudspeakers by the Method of Vector Space Projections," Haddad, Khalil C.), rejected claim 19 (and, apparently, claim 22) under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al. (United States Patent Number 6,112,218), rejected claim 20 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Shinde, rejected claim 21 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Goldberg et al., rejected claims 23 and 24 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Hamming et al., rejected claim 25 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., in further view of Shinde, and further in view of

Hamming et al., rejected claim 26 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., in further view of Goldberg et al., and further in view of Hamming et al., and rejected claims 27 and 28 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Haddad et al.

Section 112 Rejections

Claims 7, 8, 25, and 26 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner asserts that the variables α , β , and ω are not defined and that it is unclear how the impulse response h of length N shortens the impulse response of the channel because it is defined as the impulse response itself. Regarding claims 8 and 26, the Examiner further asserts that there is no definition of $\Phi(\omega)$ or $A(\omega)$ that describes the unit or purpose of the function, and no relation is made between the function $\Phi(\omega)$ and the function $A(\omega)$ to provide unity among the set of frequency constraints.

Claims 7, 8, 25, and 26 have been amended to address the Examiner's concerns and Applicant respectfully requests that the section 112 rejections be withdrawn.

Independent Claims 1, 11 and 19

Independent claims 1 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor and claim 19 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al.

Applicant notes that, in rejecting claim 9, the Examiner has acknowledged that Kapoor does not disclose employing vector space projection methods to determine said intersecting set, but asserts that Haddad teaches this limitation. Haddad, however, is directed to linear filters and the *application of vector space projection methods to determine said intersecting set in shortening impulse response filters would not be obvious to a person of ordinary skill in the art*. Independent claims 1, 11, and 19 have been amended to require that intersecting sets are determined by employing *vector space projection methods*.

Applicant also notes that Gandhi is directed to a digital filter having a recursive path in which reduced precision adder circuitry can be utilized without

increasing quantization error. Gandhi does not address the issue of employing vector space projection methods to determine intersecting sets.

Thus, Kapoor, Gandhi et al., and Haddad et al., alone or in any combination, do not disclose or suggest that the intersecting sets are determined by employing vector space projection methods, as required by independent claims 1, 11, and 19, as amended.

Additional Cited References

Shinde was also cited by the Examiner for its disclosure of an analogous digital finite impulse response (FIR) filter that does not produce any phase distortion. Applicant notes that Shinde is directed to a digital filter which has a feature of processing by interpolating digital signals x times (col. 1, lines 30-34). Shinde does not address the issue of employing vector space projection methods to determine intersecting sets.

Thus, Shinde does not disclose or suggest that the intersecting sets are determined by employing vector space projection methods, as required by independent claims 1, 11, and 19, as amended.

Goldberg et al. were also cited by the Examiner for teaching that a properly designed non-linear phase filter needs fewer coefficients than an optimal linear phase filter having the same gain response.

Applicant notes that Goldberg is directed to nonlinear-phase filters and a method for designing minimum-phase filters (see, Abstract). Goldberg does not address the issue of employing vector space projection methods to determine intersecting sets.

Thus, Goldberg et al. do not disclose or suggest that the intersecting sets are determined by employing vector space projection methods, as required by independent claims 1, 11, and 19, as amended.

Hamming et al. was also cited by the Examiner for its disclosure of cascaded filters wherein the overall response of the filters provides for a reduced pass-band amplitude variation.

Applicant notes that Hamming is directed to a multiple pass filter that attains a response that has reduced pass band and stop band amplitude variations as compared to a single section (col. 2, lines 3-10). Hamming does not address the issue of employing vector space projection methods to determine intersecting sets.

Thus, Hamming et al. do not disclose or suggest that the intersecting sets are determined by employing vector space projection methods, as required by independent claims 1, 11, and 19, as amended.

Dependent Claims 3, 13 and 21

5 Dependent claims 3 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Goldberg et al. and claim 21 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Goldberg et al.. Dependent claims 3, 13, and 21 require wherein said at least one set defining constraints that said SIRF filter must satisfy in a frequency
10 domain define a filter having a *non-linear phase*.

The Examiner acknowledges that Kapoor in view of Gandhi et al. do not disclose this limitation (see, rejection of claim 21), but asserts that it would have been obvious to one having ordinary skill in the art at the time which the invention was made to set defining constraints that the SIRF filter must satisfy to define a filter having a non-
15 linear phase response as taught by Goldberg in the method of Kapoor.

Applicant notes that Goldberg is not directed to *shortening impulse response filters* and the set disclosed in Goldberg is *not in the context of vector projection*. Applicant also notes that Haddad is limited to “convex sets” and is therefore limited to linear filters.

20 Thus, Kapoor, Gandhi et al., Goldberg et al., and Haddad et al., alone or in any combination, do not disclose or suggest wherein said at least one set defining constraints that said SIRF filter must satisfy in a frequency domain define a filter having a non-linear phase, as required by claims 3, 13, and 21.

Dependent Claims 2-10, 12-18 and 20-28

25 Dependent claims 4 and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor, claims 2 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Shinde, claims 3 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Goldberg et al., claims 5, 6, 15, and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over
30 Kapoor in view of Hamming et al., claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Shinde, and further in view of Hamming et

al., claim 8 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Goldberg et al., and further in view of Hamming et al., claims 9, 10, 17, and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad et al., claim 22 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., claim 20 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Shinde, claim 21 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Goldberg et al., claims 23 and 24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Hamming et al., claim 25 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., in further view of Shinde, and further in view of Hamming et al., claim 26 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., in further view of Goldberg et al., and further in view of Hamming et al., and claims 27 and 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Gandhi et al., and further in view of Haddad et al.

Claims 2-10, 12-18 and 20-28 are dependent on claims 1, 11, and 19, respectively, and are therefore patentably distinguished over Kapoor, Shinde, Goldberg et al., Hamming et al., Haddad et al., and Gandhi et al. (alone or in any combination) because of their dependency from amended independent claims 1, 11, and 19 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

All of the pending claims, i.e., claims 1-28, are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Kevin M. Mason".

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